

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1 1. (currently amended) A method for use in recognizing the content of a
2 media program, said method comprising the steps of:
3 filtering each first frequency domain representation of blocks of said media
4 program using a plurality of filters to develop a respective second frequency domain
5 representation of each of said blocks of said media program, said second frequency
6 domain representation of each of said blocks having a reduced number of frequency
7 coefficients with respect to said first frequency domain representation;
8 grouping frequency coefficients of said second frequency domain representation
9 of said blocks to form segments;
10 selecting a plurality of said segments; and
11 comparing selected segments to features of stored programs to identify thereby
12 said media program;
13 wherein said plurality of filters have center frequencies logarithmically spaced
14 apart from each other with a logarithmic additive factor of 1/12.

1 2. (original) The invention as defined in claim 1 wherein each grouping of
2 frequency coefficients of said second frequency domain to form a segment represents
3 blocks that are consecutive in time in said media program.

1 3. (original) The invention as defined in claim 1 wherein said plurality of
2 filters are arranged in a group that processes a block at a time, the portion of said second
3 frequency domain representation produced by said group for each block forms a frame,
4 and wherein at least two frames are grouped to form a segment.

1 4. (original) The invention as defined in claim 1 wherein said selected
2 segments correspond to portions of said media program that are not contiguous in time.

1 5. (original) The invention as defined in claim 1 wherein said plurality of
2 filters includes at least a set of triangular filters.

1 6. (original) The invention as defined in claim 1 wherein said plurality of
2 filters includes at least a set of log-spaced triangular filters.

1 7. (original) The invention as defined in claim 1 wherein the segments
2 selected in said selecting step are those that have largest minimum segment energy.

1 8. (original) The invention as defined in claim 1 wherein the segments
2 selected in said selecting step are selected in accordance with prescribed constraints such
3 that said segments are prevented from being too close to each other.

1 9. (original) The invention as defined in claim 1 wherein the segments
2 selected in said selecting step are selected for portions of said media program that
3 correspond in time to prescribed search windows that are separated by gaps.

1 10. (original) The invention as defined in claim 1 wherein the segments
2 selected in said selecting step are those that result in the selected segments having a
3 maximum entropy over the selected segments.

1 11. (original) The invention as defined in claim 1 further comprising the step
2 of normalizing said frequency coefficients in said second frequency domain
3 representation after performing said grouping step, said normalization being performed
4 on a per-segment basis.

1 12. (original) The invention as defined in claim 11 wherein said normalization
2 step includes performing at least a preceding-time normalization.

1 13. (original) The invention as defined in claim 11 wherein said normalization
2 is step includes performing at least an L2 normalization.

1 14. (original) The invention as defined in claim 1 further comprising the step
2 of storing said selected segments in a database in association with an identifier of said
3 media program.

1 15. (original) The invention as defined in claim 14 further comprising the step
2 of storing in said database information indicating timing of said selected segments.

1 16. (original) The invention as defined in claim 1 wherein said first frequency
2 domain representation of blocks of said media program is developed by the steps of:
3 digitizing an audio representation of said media program to be stored in said
4 database;
5 dividing the digitized audio representation into blocks of a prescribed number of
6 samples;
7 smoothing said blocks using a filter; and
8 converting said smoothed blocks into the frequency domain, wherein said
9 smoothed blocks are represented by frequency coefficients.

1 17. (original) The invention as defined in claim 16 wherein said filter used in
2 said smoothing step is a Hamming window filter.

1 18. (original) The invention as defined in claim 16 wherein each of said
2 smoothed blocks are converted into the frequency domain in said converting step using a
3 Fast Fourier Transform (FFT).

1 19. (original) The invention as defined in claim 16 wherein each of said
2 smoothed blocks are converted into the frequency domain in said converting step using a
3 Discrete Cosine Transform (DCT).

1 20. (canceled)

1 21. (currently amended) A method for use in recognizing the content of a
2 media program, comprising the steps of:

3 filtering a first frequency domain representation of said media program using a
4 plurality of filters to develop a second frequency domain representation of said media
5 program having a reduced number of frequency coefficients in said second frequency
6 domain representation with respect to said first frequency domain representation;

7 grouping ones of said second frequency domain representation to form segments;
8 and

9 selecting a plurality of said segments;

10 wherein said plurality of filters have center frequencies logarithmically spaced
11 apart from each other with a logarithmic additive factor of 1/12.

1 22. (currently amended) Apparatus for use in recognizing the content of a
2 media program, comprising:

3 a plurality of filters for filtering a first representation of said media program using
4 frequency coefficients to develop a second representation of said media program that has
5 a reduced number of frequency coefficients with respect to said first representation;

6 means for grouping ones of said coefficients of said second representation to form
7 segments; and

8 means for selecting a plurality of said segments;

9 wherein said plurality of filters have center frequencies logarithmically spaced
10 apart from each other with a logarithmic additive factor of 1/12.

1 23. (currently amended) Apparatus for use in recognizing the content of a
2 media program, comprising:

3 means for filtering a first frequency domain representation of said media program
4 using a plurality of filters to develop a second frequency domain representation of said
5 media program having a reduced number of frequency coefficients in said second

6 frequency domain representation with respect to said first frequency domain
7 representation;

8 means for grouping ones of said second frequency domain representation to form
9 segments; and

10 means for selecting a plurality of said segments;

11 wherein said plurality of filters have center frequencies logarithmically spaced
12 apart from each other with a logarithmic additive factor of 1/12.

1 24. (currently amended) A method for use in recognizing the content of a
2 media program, said method comprising the steps of:

3 filtering each first frequency domain representation of blocks of said media
4 program using a plurality of filters to develop a respective second frequency domain
5 representation of each of said blocks of said media program, said second frequency
6 domain representation of each of said blocks having a reduced number of frequency
7 coefficients with respect to said first frequency domain representation;

8 grouping frequency coefficients of said second frequency domain representation
9 of said blocks to form segments; and

10 searching a database for substantially matching segments, said database having
11 stored therein segments of media programs and respective corresponding program
12 identifiers;

13 wherein said plurality of filters have center frequencies logarithmically spaced
14 apart from each other with a logarithmic additive factor of 1/12.

1 25. (original) The invention as defined in claim 24 further comprising the step
2 of indicating that said media program cannot be identified when substantially matching
3 segments are not found in said database in said searching step.

1 26. (original) The invention as defined in claim 24 wherein said data base
2 includes information indicating timing of segments of each respective media program
3 identified therein, and wherein a match may be found in said searching step only when

4 the timing of said segments produced in said grouping step substantially matches the
5 timing of said segments stored in said database.

1 27. (original) The invention as defined in claim 24 wherein said matching
2 between segments is based on the Euclidean distances between segments.

1 28. (original) The invention as defined in claim 24 further comprising the step
2 of identifying said media program as being the media program indicated by the identifier
3 stored in said database having a best matching score when substantially matching
4 segments are found in said database in said searching step.

1 29. (original) The invention as defined in claim 28 further comprising the step
2 of determining a speed differential between said media program and a media program
3 identified in said identifying step.

1 30. (original) The invention as defined in claim 28 wherein said matching
2 score for a program P_i is determined by $P_i = \frac{1}{z} \sum_{j=1}^z f(S'_{j=1} - S_j(P_i))$.

1 31. (original) The invention as defined in claim 28 further comprising the
2 steps of:
3 repeating said filtering, grouping, searching and identifying; and
4 determining, in the event of another match, whether said identified program is the
5 same program determined prior to said repetition or a different program.

1 32. (original) The invention as defined in claim 31 wherein said determining
2 step is based on an overlap score.

1 33. (original) The invention as defined in claim 32 wherein overlap score is
2 calculated between said program determined prior to said repetition, P0, and said
3 program determined during said repetition, P1, is calculated as

4 Overlap score= $(t_{\text{end}}-t_{\text{begin}})/(\text{end time of P1}-\text{beginning time of P1})$
5 where
6 t_{end} is min(end time of P0, P1); and
7 t_{begin} is max(beginning time of P0, P1).

1 34. (currently amended) A method for use in recognizing the content of a
2 media program, said method comprising the steps of:
3 filtering a first frequency domain representation of said media program using a
4 plurality of filters to develop a second frequency domain representation of said media
5 program having a reduced number of frequency coefficients in said second frequency
6 domain representation with respect to said first frequency domain representation;
7 grouping ones of said second frequency domain representation to form segments;
8 and
9 searching a database for substantially matching segments, said database having
10 stored therein segments of media programs and respective corresponding program
11 identifiers;
12 wherein said plurality of filters have center frequencies logarithmically spaced
13 apart from each other with a logarithmic additive factor of 1/12.

1 35. (currently amended) Apparatus for use in recognizing the content of a
2 media program, comprising:
3 means for filtering a first frequency domain representation of said media program
4 using a plurality of filters to develop a second frequency domain representation of said
5 media program having a reduced number of frequency coefficients in said second
6 frequency domain representation with respect to said first frequency domain
7 representation;
8 means for grouping ones of said second frequency domain representation to form
9 segments; and
10 means for searching a database for substantially matching segments, said database
11 having stored therein segments of media programs and respective corresponding program
12 identifiers;

13 wherein said plurality of filters have center frequencies logarithmically spaced
14 apart from each other with a logarithmic additive factor of 1/12.

1 36. (original) The invention as defined in claim 35 wherein said first
2 frequency domain representation of said media program comprises a plurality of blocks
3 of coefficients corresponding to respective time domain sections of said media program
4 and said second frequency domain representation of said media program comprises a
5 plurality of blocks of coefficients corresponding to respective time domain sections of
6 said media program.

1 37. (currently amended) A computer readable storage arranged to store
2 segments derived from, and representative of, various media programs, said segments of
3 each respective one of said media programs being stored in said database so as to be
4 associated with a unique media program identifier;

5 wherein each of said segments is developed by filtering a first frequency domain
6 representation of said media program using a plurality of filters to develop a second
7 frequency domain representation of said media program having a reduced number of
8 frequency coefficients in said second frequency domain representation with respect to
9 said first frequency domain representation, and grouping ones of said second frequency
10 domain representation;

11 wherein said plurality of filters have center frequencies logarithmically spaced
12 apart from each other with a logarithmic additive factor of 1/12.

1 38 (canceled)

1 39. (canceled)

1 40. (canceled)